CLAIMS

1. A method of providing an engine stop mode of operation for a hybrid electric vehicle having an engine that is operatively and selectively coupled to an electric drive motor and transmission, comprising the steps of:

(1) defueling the engine and maintaining rotation of the engine by rotation of the electric drive motor at a vehicle speed that is less than a vehicle stop threshold value; and

(2) decoupling the engine and transmission in response to a first predetermined vehicle operating condition and stopping the rotation of the engine using the electric drive motor to apply a torque to oppose the rotation of the engine.

2. The method of claim 1, further comprising the steps of:

(3) restarting rotation of the engine in response to a second predetermined vehicle operating condition using the electric drive motor; and

(4) recoupling the engine and transmission.

3. The method of claim 2, further comprising the step of :

(5) refueling the engine at a vehicle speed that is greater than a vehicle start threshold value.

4. The method of claim 1, wherein the first predetermined vehicle operating condition is an open vehicle door.

5. The method of claim 2, wherein the second predetermined vehicle operating condition is a closed vehicle door.

6. The method of claim1, wherein the vehicle stop threshold value is a function of a battery budget factor.

7. The method of claim2, wherein the vehicle restart threshold value is a function of a battery budget factor.

8. A method of providing an engine stop and restart mode of operation for a hybrid electric vehicle having an engine that is operatively and selectively coupled to an electric drive motor and transmission, comprising the steps of:

(1) defueling the engine and maintaining rotation of the engine by rotation of the electric drive motor at a vehicle speed that is less than a vehicle stop threshold value;

(2) decoupling the engine and transmission in response to a first predetermined vehicle operating condition and stopping the rotation of the engine using the electric drive motor to apply a torque to oppose the rotation of the engine;

(3) restarting rotation of the engine in response to a second predetermined vehicle operating condition using the electric drive motor; and

(4) recoupling the engine and transmission.

9. The method of claim 8, further comprising the step of :

(5) refueling the engine at a vehicle speed that is greater than a vehicle start threshold value.

10. The method of claim 8, wherein the first predetermined vehicle operating condition is an open vehicle door and the second predetermined vehicle operating condition is a closed vehicle door.

11. The method of claim8, wherein the vehicle stop threshold value and the vehicle restart threshold value are a function of a battery budget factor.

12. A method of providing an engine stop mode of operation for a hybrid electric vehicle having an engine that is operatively and selectively coupled to an electric drive motor and transmission, comprising the steps of:

(1) defueling the engine and maintaining a rotational speed of the engine by rotation of the electric drive motor at a vehicle speed that is less than a vehicle stop threshold value;

(2) initiating a motor off request in response to a first predetermined vehicle operating condition;

(3) commanding a neutral state of the engine and transmission, whereby the neutral state comprises selecting the operative decoupling of the engine from the transmission;

(4) confirming that the neutral state has been attained;

(5) stopping the rotation of the engine using the electric drive motor to apply a torque to oppose the rotation of the engine;

(6) initiating a motor on request in response to a second predetermined vehicle operating condition;

(7) restarting the rotation of the engine without fuel using the electric drive motor to apply a torque to the engine;

(8) commanding a range state of the engine and transmission, whereby the range state comprises selecting the operative coupling of the engine and transmission;

(9) commanding a vehicle speed to the electric drive motor, whereby if the vehicle speed command is greater than a vehicle restart threshold value, proceeding to step 10, and whereby if the vehicle speed is less than or equal to the vehicle restart threshold, returning to step 2;

(10) refueling the engine.

13. The method of claim 12, wherein the first predetermined vehicle operating condition is an open vehicle door.

14. The method of claim 12, wherein the second predetermined vehicle operating condition is a closed vehicle door.

15. The method of claim12, wherein the vehicle stop threshold value is a function of a battery budget factor.

16. The method of claim 12, wherein the vehicle restart threshold value is a function of a battery budget factor.